

REMARKS

Applicants request favorable reconsideration and allowance of the subject application in view of the preceding amendments and the following remarks.

Claims 1-34 are presented for consideration. Claims 1-3, 11, 13, 22-25, and 34 are independent. Claim 22 has been amended strictly to improve its form. Support for the changes can be found in the application, as originally filed. No new matter has been added.

Formal Matters

Claims 4, 10, 14, 20, 21, 26, 32, and 33 have been objected to under 37 C.F.R. § 1.75(c) as being in improper form. The Examiner correctly notes that a multiple dependent claim should refer to other claims in the alternative only, but seems to have misapplied the rule in this case. Applicants submit that claims 4, 10, 14, 20, 21, 26, 32, and 33, each written in the form "An apparatus according to any one of claims X, Y, and Z," do in fact refer to other claims in the alternative only. Clearly, such a claim refers back to only one of claims X, Y, and Z, just the same as if it had been written in the form "An apparatus according to claim X, Y, or Z." See M.P.E.P. §

608.01(n) (noting that the following language is acceptable: "A gadget as in one of claims 4-7"). Applicants, therefore, request withdrawal of this objection and favorable consideration of claims 4, 10, 14, 20, 21, 26, 32, and 33.

Claims 5, 6, 16, 27, and 28 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Specifically, the Examiner asserts that "[t]he elements noted in the claims are not equivalents of one another." Applicants traverse this rejection.

A dependent claim is proper if it further limits the claim from which it depends and particularly points out and distinctly claims the subject matter which the applicant regards as his or her invention. Respectfully, Applicants are unaware of any authority requiring elements recited in a claim to be "equivalents of one another."

Each of claims 5, 6, 16, 27, and 28 depends from an independent claim, and each further defines one of the elements recited in the independent claim from which it depends. For example, claim 5 depends from claim 1, which is directed to an illuminator comprising, inter alia, an illumination system with at least one unit having a surface on at least a portion of which a titanium oxide film is provided. Claim 5 further limits claim

1 by reciting that the unit comprises at least one of a diaphragm, a shutter, and a lens barrel. Accordingly, if an illuminator includes an illumination system with a unit that has a surface on at least a portion of which a titanium oxide film is provided, and the unit comprises one or more of the components listed in claim 5, then such an illuminator falls within the scope of claim 5. If, however, the unit does not comprise one or more of these components, then the illuminator does not come within the scope of claim 5. Read properly, there can be no doubt as to what claim 5 covers and what it does not. That is all that

§ 112, second paragraph requires. This same reasoning holds true for claims 6, 16, 27, and 28.

Because claims 5, 6, 16, 27, and 28 are definite as to what Applicants have chosen to claim as their invention, the § 112, second paragraph rejection of those claims should be withdrawn.

Substantive Rejections

Claims 1, 2, 5-9, 11-13, 15-19, 22-24, 27-31, and 34 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,028,967 to Yamada, et al., in view of U.S.

Patent No. 5,661,546 to Taniguchi. Claims 3, 13, and 25 were rejected under § 103(a) as being unpatentable over U.S. Patent No. 4,358,198 to Moriyama, et al., in view of Taniguchi. For the reasons that follow, Applicants traverse these rejections.

Independent claims 1-3 each relates to an illuminator for illuminating an object with a luminous flux emitted from a light source, in which the illuminator comprises an illumination system through which the luminous flux is projected onto the object. In claim 1, the illumination system includes at least one unit having a surface on at least a portion of which a titanium oxide film is provided. In claim 2, the illumination system includes a plurality of optical units, at least one of which has a surface on at least a portion of which a titanium oxide film is provided. In claim 3, the illumination system includes at least one optical unit and a supporting unit therefor, and the supporting unit has a surface on at least a portion of which a titanium oxide film is provided.

Independent claims 11-13 each relates to an exposure apparatus for exposing a wafer with a pattern formed on a mask. The pattern is illuminated with a luminous flux emitted from a light source and projected through an illumination system. In claim 11, the exposure apparatus comprises at least one unit

having a surface on at least a portion of which a titanium oxide film is provided. In claim 12, the exposure apparatus comprises a plurality of optical units, at least one of which has a surface on at least a portion of which a titanium oxide film is provided. In claim 13, the exposure apparatus comprises at least one optical unit and a supporting unit for supporting the at least one optical unit, the supporting unit having a surface on at least a portion of which a titanium oxide film is provided.

Independent claim 22 is directed to a method for fabricating a device using an exposure apparatus. The method comprises the steps of emitting a luminous flux from a light source, projecting the luminous flux through an illumination system, disposing a reticle having a pattern formed thereon in a path traveled by the luminous flux, providing a titanium oxide film on at least a portion of a surface of a unit of the exposure apparatus, exposing a wafer with the pattern formed on the reticle by illuminating the pattern with the luminous flux emitted from the light source and projected through the illumination system, and developing the wafer.

Independent claims 23-25 each relates to a projection aligner for illuminating a pattern formed on a mask with a luminous flux and exposing a wafer by projecting the pattern onto

the wafer. The projection aligner comprises a light source for emitting a luminous flux, an illumination system through which the luminous flux is passed, and a projection optical system for projecting the pattern onto the wafer. In claim 23, each of the illumination system and the projection optical system includes at least one unit, and at least one of those units has a surface on at least a portion of which a titanium oxide film is provided. In claim 24, each of the illumination system and the projection optical system includes a plurality of optical units, and at least one of those optical units has a surface on at least a portion of which a titanium oxide film is provided. In claim 25, each of the illumination system and the projection optical system includes at least one optical unit and a supporting unit therefor, and at least one of the supporting units has a surface on at least a portion of which a titanium oxide film is provided.

Independent claim 34 is directed to a method for fabricating a device comprising the steps of emitting a luminous flux from a light source, illuminating a pattern formed on a reticle with the luminous flux, exposing a wafer by projecting the pattern onto the wafer after the reticle is aligned with the wafer using a projection aligner including at least one unit

having a surface on at least a portion of which a titanium oxide film is provided, and developing the wafer.

Applicants submit that the cited art does not disclose or suggest many inventive features recited in independent claims 1-3, 11-13, 22-25, and 34, including providing a titanium oxide film on the surface of certain components of an illuminator, exposure apparatus, or projection aligner.

Yamada, et al. relates to an achromatic lens for use in reduction projection aligners in ultraviolet lithography, etc. In one embodiment, the achromatic lens consists of a lens made of germanium-containing silica glass and a lens made of high-purity silica glass or fluorine-containing, high-purity silica glass. In another embodiment, the achromatic lens consists of a lens made of silica glass containing germanium dioxide and boron oxide and a lens made of high-purity silica glass or fluorine-containing, high-purity silica glass. At col. 3, lines 14-24, Yamada, et al. states:

To achieve the object of the present invention, the high-purity silica glass should have a purity of 99.9% or more, and the fluorine-containing, high-purity silica glass should have a purity of 99.9% or more for SiO₂ + F. Particularly, to avoid the ultraviolet absorption, impurities such as transition elements and rare earth elements should be reduced to several hundreds of ppm or less, preferably several tens of pp, or

less, and more preferably several ppm or less. For instance, in the case of titanium as an impurity, its concentration should be 1 ppm or less.

(Emphasis added.)

The reason for this, addressed at col. 2, lines 7-15, is that oxides of transition elements and rare earth elements, such as titanium oxide, cause ultraviolet absorption, resulting in the reduction of transmittance and the generation of fluorescence. Accordingly, Yamada, et al. teaches that "these additives are not suitable for achromatic lenses for ultraviolet rays, and rather should be removed." Col. 2, lines 13-15 (emphasis added).

The Examiner asserts that Yamada, et al. "discloses a lens on which a titanium oxide film is provided . . . for use in reduction projection aligner systems." Respectfully, Applicants disagree with the Examiner's characterization of Yamada, et al. As explained above, if anything, Yamada, et al. teaches away from the addition of titanium oxide, in any form, to components of an illuminator, exposure apparatus, or projection aligner, such as those used in ultraviolet lithography. Certainly, the teachings of Yamada, et al. would not motivate one skilled in the art to apply a titanium oxide film to the surface of such components, as recited in the independent claims.

Taniguchi discloses a projection exposure apparatus comprising a calculator for calculating a correction value of an imaging characteristic of a projection optical system by use of predetermined calculation parameters. Evidently, the Examiner relies on Taniguchi for its teaching of a particular structure for an aligner system. Even so, Taniguchi fails to teach or suggest the use of a titanium oxide film on certain components of an illuminator, exposure apparatus, or projection aligner, as recited in the independent claims. Therefore, Yamada, et al., even when considered in conjunction with Taniguchi, would not have led one skilled in the art to come up with the claimed invention.

Moriyama, et al. discloses an apparatus for moving a table or a stage which is used for moving a specimen in a step and repeat camera, reduction projection aligner system, or the like. At col. 3, lines 18-25, Moriyama, et al. further discloses that guide rails of the apparatus may be made of titanium or a titanium alloy, in order to achieve a reduction in weight. These rails may be plated with a material such as chromium, nickel, iron, stainless steel, ceramics, and the like, having a higher hardness and wear resistance than the rails themselves.

Moriyama, et al., col. 3, lines 26-37.

The Examiner asserts that Moriyama, et al. "discloses a supporting unit coated with titanium for use in a projection aligner system." Applicants respectfully disagree. First, while the guide rails in Moriyama, et al. may be constructed of titanium, they are coated with another material. Second, the supporting units referenced in claims 3, 13, and 25 of the subject application support one or more optical units. The guide rails of Moriyama, et al., as Applicants understand, support a specimen stage, but do not support any optical units. And third, the reason Moriyama, et al. discloses for using titanium in the guide rails—to achieve a reduction in weight—is completely different from the reason titanium oxide film is applied to certain components of the claimed invention—to reduce contamination of optical units.

For the foregoing reasons, Applicants submit that none of the cited art, whether taken individually or in combination, teaches or suggests the inventive features of the present invention recited in independent claims 1-3, 11-13, 22-25, and 34. Therefore, those claims should be deemed allowable over the cited art.

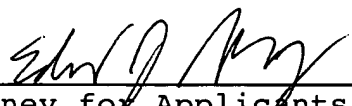
Dependent claims 4-10, 14-21, and 26-33 also should be deemed allowable, in their own right, for defining other

patentable features of the present invention, in addition to those features recited in the independent claims from which they depend. Further individual consideration of these dependent claims is requested.

Applicants submit that this application is in condition for allowance. Favorable reconsideration, withdrawal of the objections and rejections set forth in the above-noted Office Action, and an early Notice of Allowance are requested.

Applicants' undersigned attorney may be reached in our Washington, D.C., office by telephone at (202) 530-1010. All correspondence should be directed to our address listed below.

Respectfully submitted,



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